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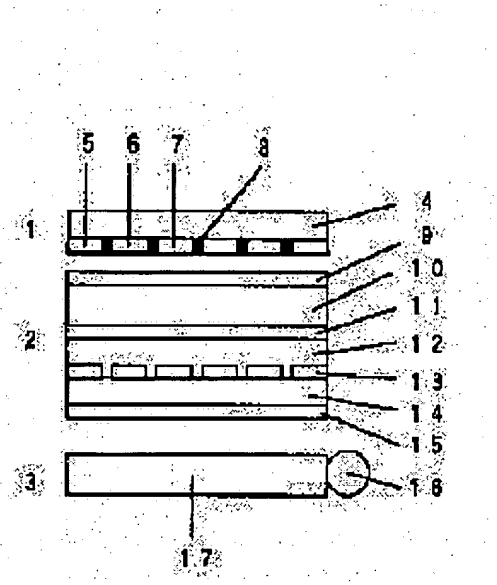
(54) LUMINOUS DISPLAY

(57)Abstract:

PROBLEM TO BE SOLVED: To realize a display with a wide view angle, long life and high color purity by providing a light wavelength conversion mechanism containing an organic phosphor capable of light emitting blue, green and red with at least a kind or above of light with a central wavelength of a specified area.

SOLUTION: This display consists of the light wavelength conversion mechanism 1 containing the organic phosphor, an optical shutter mechanism 2 and an element 3 converting electric energy to the light. The light wavelength conversion mechanism 1 contains the organic phosphor, and can emit the light in the visible region by the light of at least a kind or above of the light with the central wavelength of 390-700nm. When three primary colors are obtained for a color display, the matter that a light emission central wavelength of a light source enters within the range of 390-500nm is preferred, and most preferably, it enters within the range of 440-500nm. In such a case, by using the organic phosphor, a long wavelength side of a wavelength band is used as the light source until an area visual sensitively visible to blue-green such as 500nm. Thus, a full color image display without view angular dependency becomes possible.



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CLAIMS

[Claim(s)]
[Claim 1] The spontaneous light display which consists of a light emitting device which changes into light the light wave length translator which emits the light including an organic fluorescent substance in order by at least one kind of light whose main wavelength is 390-700nm, an optical shutter device, and electrical energy.
[Claim 2] The spontaneous light display according to claim 1 characterized by the organic fluorescent substance contained in a light wave length translator emitting the light by at least one kind of light with a main wavelength of 390-500nm.
[Claim 3] Claim 1 characterized by arranging the organic fluorescent substance with which a light wave length translator emits the light of at least one kind of color chosen from from among blue, green, and red, and emits light in each color to the field to which it was set to the light wave length translator thru/or a spontaneous light display given in two.
[Claim 4] The spontaneous light display according to claim 3 characterized by the appointed field being a stripe configuration, a grid configuration, or a delta configuration.
[Claim 5] The spontaneous light display according to claim 4 characterized by the pitch of a stripe configuration, a grid configuration, or a delta configuration being 500 micrometers or less.
[Claim 6] claims 1-5 characterized by a black field existing between the fields where the light wave length translator was defined -- a spontaneous light display given in either.
[Claim 7] claims 1-6 characterized by an optical shutter device being a active-matrix drive liquid crystal device -- a spontaneous light display given in either.
[Claim 8] claims 1-7 to which liquid crystal used for an optical shutter device is characterized by the guest host and being able to twist and being either of the nematic molds -- a spontaneous light display given in either.
[Claim 9] claims 1-8 which carry out the description of the light emitting device which changes electrical energy into light being a field-like illuminant using the light source chosen from a fluorescent lamp or light emitting diode -- a spontaneous light display given in either.
[Claim 10] claims 1-9 which it consists of image display sides in order of a light wave length translator, a polarizing plate, an electrode, liquid crystal, an electrode, a polarizing plate, and a light emitting device, and a light wave length translator emits light to blue, green, and red three primary colors, and are characterized by a multicolor display being full color or possible -- a spontaneous light display given in either.
[Claim 11] claims 1-10 -- the light wave length translator which emits the light by at least one kind of light currently used for the spontaneous light display given in either.
[Claim 12] The light wave length translator according to claim 11 characterized by arranging a half mirror between a light wave length translator and a polarizing plate.
[Claim 13] The light wave length translator according to claim 11 or 12 characterized by a fluorescent substance emitting polarization.
[Claim 14] claims 11-13 characterized by preparing the layer which does not penetrate the light of

specific wavelength to an image display side from a light wave length translator -- a light wave length translator given in either.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the spontaneous light display which can perform a segment display or a matrix display especially about the spontaneous light display which consists of a light emitting device which changes the light wave length translator containing a fluorescent substance, an optical shutter device, and electrical energy into light. The spontaneous light display of this invention is useful as a thin shape and a lightweight display to OA and the public welfare devices for household electric appliances, such as a personal computer, a monitor, a word processor, a Personal Digital Assistant, a mobile phone, television, a video camera, a cassette recorder, CD recorder, a laser disc, a stereo, a videocassette recorder, a camera, a car stereo, a car-navigation system, and a karaoke system, a public display device, etc.
[0002]
[Description of the Prior Art] There are strong dielectric liquid crystal besides the STN method with which high definition, the TFT liquid crystal which can respond even to a movie display by high-speed response, and current or the becoming improvement in the engine performance is found, antiferroelectric liquid crystal, guest host liquid crystal using dichroism coloring matter, etc. as liquid crystal. in recent years, liquid crystal displays are a thin shape, a light weight, and low power consumption as compared with the conventional CRT -- etc. -- it has spread quickly according to the description.
[0003] However, since the current liquid crystal display is controlling the light of a back light by the liquid crystal shutter, when image quality change is carried out and it sees from [four directions] across with an angle of visibility, image quality deteriorates greatly. Especially in the color display as which high definition, such as a notebook computer and television, is required, the angle-of-visibility dependency poses a big problem. In order to solve this problem, various approaches, such as the division orientation method for giving current [current / of orientation], for example, the direction which is different in the divided pixel, a pixel split plot experiment which gives an electrical-potential-difference - permeability property which is different in the divided pixel, and an approach using an optical compensating plate, are proposed, the transmitted light is extended to whenever [wide-angle], the reversal when seeing from four directions and a contrast fall control, and image-quality maintenance is performing.
[0004] The display of spontaneous light, such as CRT, an electro luminescent display, an organic electro luminescent display, a plasma display, Flat CRT, a fluorescent indicator tube, and LED, is accepted as a good display of visibility by the display of spontaneous light effective in controlling the image quality change by the angle of visibility, and raising visibility. However, the conventional spontaneous light display had various faults as compared with the liquid crystal display, and needed to be improved. For example, since CRT made glass the quality of the material, it was heavy, and since depth was required, it had the fault which takes a location. Moreover, its driver voltage was very as high as more than 100V, and since blue luminescence of high brightness of an electro luminescent display was not completed, full-color-izing was difficult for it. The improvement in dependability of highly minute pixel formation

being difficult for an organic electro luminescent display and a component is a technical problem. Furthermore, power consumption of the plasma display was high and highly minute-ization of it was not completed on a small display 20 inches or less. Although Flat CRT is a thin shape compared with the conventional CRT, the fault of being heavy is not solved in a big screen. The fluorescent indicator tube is inferior in respect of big-screen[highly-minute-izing and]-izing and full-color-izing compared with the liquid crystal display. Production of a field-like illuminant is difficult for LED, and cannot apply it to the display display for OA. Thus, although the conventional spontaneous light display was excellent in visibility, when using it as a display, it had various faults. As current and a flat-panel display, the visual field expansion advanced type liquid crystal display is examined rather than the direction which improves a spontaneous light display in many cases.

[0005] However, advanced ultra-fine processing technology is required for the angle-of-visibility expansion technique of the conventional liquid crystal display, it is bad, and is high. [of cost] [of the yield] Moreover, even if it extended the angle of visibility in the present condition, the screen could be seen [no] from include angles, but fundamental solution was difficult.

[0006] Then, the approach of compensating a fault in the range in which a spontaneous light display does not spoil the outstanding description, either is examined. The example in an organic electro luminescent display is given. Although it is necessary to full-color-izing of an organic electroluminescence to form a very detailed pixel, a damage will be given to a component in pattern NINGU which uses a resist etc. in order to use the organic substance. Therefore, having acquired the property practical now is restricted to the monochrome display. In order to solve this problem, by arranging the color translator which used the fluorescent substance for the front face of the monochrome display which performs blue luminescence, displaying green and red with energy lower than blue is devised (JP,3-152897,A, JP,5-258860,A, JP,8-222369,A, JP,8-279394,A). Furthermore, the component (JP,6-267301,A) which has arranged the fluorescent substance in the front face of the component which emits the ultraviolet rays of short wavelength is also known. However, as for these techniques, by the ultraviolet-rays light emitting device, the optical output is very small and the problem of a short paddle also in a component life fully [the dependability of the component life of an organic electroluminescence element in which blue luminescence which is the light source is possible, a resistance to environment, and a component property] remains.

[0007] Then, in the liquid crystal display excellent in a life and endurance, in order to solve a problem of low efficiency for light utilization, a problem of an angle of visibility, etc. which used the conventional color filter, some examination has been made. preparing a fluorescent substance layer in three primary colors in the configuration corresponding to each pixel in improvement in the use effectiveness of light at the optical incidence side of the liquid crystal shutter of the conventional back light method liquid crystal display -- high -- the approach of performing a brightness display (JP,63-15221,A, JP,8-36175,A), and the method (JP,7-325392,A) of making a fluorescent substance mix into a color filter are devised.

[0008] However, since the problem of an angle of visibility is unsolvable with this technique, the angle-of-visibility dependency of a liquid crystal display is abolished, and examination that a technical problem will be solved by the approach (JP,6-14247,B, JP,7-253576,A, JP,8-62602,A) of using a fluorescent substance instead of the pigment of the color filter conventional for the purpose of raising color purity by high brightness or a color is made.

[0009]

[Problem(s) to be Solved by the Invention] However, in spite of having made great efforts, the practical display which does not have an angle-of-visibility dependency actually is not developed.

[0010] By the approach of arranging a fluorescent substance in that it has not conquer the fundamental fault which the liquid crystal itself is holding comparatively which needs a complicated device at a raise in the angle of visibility of a liquid crystal display, and the front face of a spontaneous light display, by the ultraviolet rays light emitting device, the optical output is very small and the dependability of component properties, such as a component life and a resistance to environment, also fully depends a component life on the reason of a short paddle.

[0011] Furthermore, in the liquid crystal display using a fluorescent substance, since neither liquid crystal and a polarizing plate deteriorating in ultraviolet rays since the excitation light's is the wavelength of an ultraviolet region, nor a liquid crystal shutter had sufficient spectral characteristic to ultraviolet radiation, a practical contrast manifestation was not completed. By the case where the wavelength like purple is used from near-ultraviolet, although such a phenomenon was eased, since there was no ingredient which shines efficiently in this wavelength field, sufficient brightness and color purity were not obtained with the fluorescent substance of the inorganic system currently used conventionally. As an approach of solving the problem of the improvement in color purity, the method of making a color filter form in an image display side from a firefly luminescence layer causes the steep increment in cost, and has the fault that yield will also fall.

[0012]

[Means for Solving the Problem] In order that this invention persons may attain the above-mentioned purpose, as a result of inquiring wholeheartedly, liquid crystal equipment with endurance and dependability practical as an optical shutter is used. By preparing the light wave length translator containing the organic fluorescent substance which can emit light in blue, green, and red with at least one or more kinds of light of the field whose main wavelength is 390-700nm instead of the conventional color filter When the special light source like ultraviolet rays was not needed but the problem of a raise in an angle of visibility and the improvement in a life was able to be solved at once, header this invention was reached [that the high display of color purity is attained, and].

[0013]

[Embodiment of the Invention] The organic fluorescent substance is contained in the light wave length translator in this invention, and in order to display one color, one kind or two kinds or more of fluorescent substances are contained. Therefore, in order to make a color display possible, three kinds, blue, green, and red, are required at the lowest, and the fluorescent substance beyond it may be contained in order to raise color purity and luminescence brightness. However, since the light by which outgoing radiation is carried out from a light emitting device in order to excite a fluorescent substance can be used as it is, for example, when blue glow is used as the light source, the minimum number of fluorescent substance use becomes two kinds. It is the description that the light can be emitted by at least one or more kinds of light this light wave length translator's containing the organic fluorescent substance and whose main wavelength are 390-700nm. Usually, since luminescent color conversion in the color of energy with an expensive fluorescent substance cannot be performed, when obtaining three primary colors for color display, as for the emission center wavelength of the light source, it is desirable to go into the range of 390-500nm, and it is 440-500nm most preferably. using an organic fluorescent substance in this invention -- the long wave of a wavelength region -- it says that a merit side is 500nm -- visual -- bluish green - it can be used as the light source to the field which looks green. It is because there is a fact that the fluorescent substance of a specific combination, for example, a bis(2-methyl-8-quinolinolato) BIFENORATO aluminum complex, and the mixture of perylene can change the light near 500nm into blue luminescence of high color purity.

[0014] A fluorescent substance indispensable to this invention is the quality of organic. Since the reason is excited by the light and can emit the light, it is not using the ultraviolet rays which cause many failures for the light source. Many organic substance can absorb the light of a blue field, and can emit the light of blue, green, and red. By combining with the fluorescent substance with which the fluorescent substance which absorbs the light of metaphor green and emits red also absorbs blue, and emits green, it is possible to also make red emit light, making energy transfer cause using a blue light. Thus, an organic fluorescent substance can perform three-primary-colors luminescence easily using the light of being blue, and has the description that fine tuning of a color tone is attained easily, by adjusting the chemical structure. Therefore, although use of an organic fluorescent substance is indispensable in this invention, various matter as what suits this invention is known. Although this invention shows an usable desirable organic fluorescent substance below, it is not the object limited to these. As an example, naphthalene, an anthracene, a phenanthrene, a chrysene, Perylene, triphenylene, a pyrene, an acenaphthene, a fluorene, a biphenyl, Terphenyl, diphenyl benzene, quarter phenyl, a diphenyl anthracene, Aromatic hydrocarbon

system compounds, such as rubrene and its substitution product, diaryl ethylene, A diaryl polyene, allyl compound permutation vinylbenzene, 1, 4-bis(2-methyl styryl) benzene, Still pen system coloring matter, such as a transformer -4 and a 4'-diphenyl still pen, a 7-hydroxy-4-methyl coumarin (coumarin 4), A coumarin 153, a coumarin 6, a coumarin 7, a coumarin 120, a coumarin 2, a coumarin 339, a coumarin 1, a coumarin 138, a coumarin 106, a coumarin 102, coumarin 314T, The coumarin coloring matter of a coumarin 338, a coumarin 151, a coumarin 4, a coumarin 314, a coumarin 30, a coumarin 500, a coumarin 307, a coumarin 334, a coumarin 343, and coumarin 337 grade, Although it is another coumarins pigment system color, the North America Free Trade Agreement RUIMIDO coloring matter of the BASIC yellow 51 and the SORUPENTOI yellow 11, and SORUPENTOI yellow 116 grade, An allyl compound acetylene series compound, a furan, a thiophene, a pyrrole, benzofuran, Phthalocyanine derivatives, such as a metal phthalocyanine represented by benzothiophene, Indore and those derivatives, a porphyrin, and the copper phthalocyanine or a non-metal phthalocyanine, the diaza represented by PYRROMRTHENE 650, 546, 556, 567, 580, and 597 which can come to hand at EXCITON -- a bora -- an indacene derivative -- Allyl compound permutation oxazole, OKISA diazole, thiadiazole, benzoxadiazole, Five membered ring heterocyclic compounds, such as benzothiadiazole, those derivatives, and allyl compound permutation pyrazoline, pyrazoles, those derivatives, A quinoline, an isoquinoline, benzoquinoline, phenanthridine and those derivatives, Pyrazine, pyridazine, a pyrimidine, quinoxaline, phenazine, quinazoline, Six membered ring heterocyclic compounds, such as a phenanthroline, Quinacridone, pyrenes, and those derivatives, A fluorescein, dichlorofluorescein, a rhodamine 110, rhodamine 6G tetra-FURORO borate, Rhodamine 6G, rhodamine 6G perchlorate, rhodamine 19 perchlorate, Rhodamine system derivatives, such as rhodamines, such as Rhodamine B, sulfo Rhodamine B, and the sulfo rhodamine 101, The pyronin, a bends xanthene, benzodioxane and its derivative, oxazine 170 perchlorate that has two different hetero atoms in a ring, Oxazine 1 perchlorate, NIRU blue A perchlorate, the oxazine derivative represented by NIRU red, Oxygen content heterocyclic compounds, such as a phenothiazine derivative and a FENO oxazine derivative, alpha, beta-partial saturation ketone, an anthrone, benzanthrone, anthra pyridone, an oxazole anthra pyridine and full -- me -- non, benzoquinoline, and a naphthoquinone -- As anthraquinone, a naphthacene quinone, hepta-SENKINON, pyran TRON, KARUBO styryl, oxazolone, indigo, thioindigoes, those derivatives, and a naphthalic acid compound Acetylamino naphthalic acid, North America Free Trade Agreement RUIMIDO, phenylhydrazine, Carbonyl content compounds, such as perylene tetracarboxylic acid, naphth xylene benzimidazole, and those derivatives, Cyanine system coloring matter, such as a metal complex with quinolinol and a flavonol derivative, and a 4-dicyanomethylene-2-methyl-4-dicyanomethylene-4-dicyanomethylene-2-methyl-6-(p-dimethylaminostyryl)-4H-bilane (DCM), Quinolinol derivatives, such as tris (8-quinolinolato) aluminum and bis(2-methyl-8-quinolinolato) pyridino RATOARU minium, etc. are mentioned.

[0015] In this invention, although use of an organic fluorescent substance is indispensable, the inorganic fluorescent substance, the pigment, the color, etc. may be included. for example, as an organic fluorescent substance and an inorganic compound usable together as a fluorescent substance A phosphoric acid salt (Sr, Mg) (32(PO4):Sn2+ (orange-red color)), Germane acid chloride (4MgO-GeO2:Mn4+ (deep red)), yttrium acid chloride (Y2 O3:Eu3+ (red)), A vanadate (Y, VO4:Eu3+ (red)), a halo silicic-acid salt (Sr2Si3O8and2SrCl2:Eu2+ (bluish green color)), Fluorescent substances for high pressure mercury fluorescent lamps, such as an aluminate (Ba, Mg) (2aluminum16O24:Eu2+(blue);(Ba, Mg) 2aluminum16O24:Eu2+, Mn2+(green);Y2O3andaluminum2O3:Tb3+ (yellowish green)), ZnS:Ag (blue), ZnS:Au, Cu and aluminum (green), ZnS:Cu, aluminum (green), Fluorescent substances for CRT, such as Y2O2S:Eu3+ (red), ZnO:Zn (green), ZnS: [Zn]+In 2O3 (blue), ZnS:Cu, aluminum+In 2O3 (********), ZnS:Au, aluminum+In 2O3 (yellowish green), S:Au (Zn 0.9, Cd0.1), Fluorescent substances for fluorescent indicator tubes, such as aluminum+In 2O3, PrF3 (white), NdF3 (sour orange), SmF3 (orange-red), EuF3 (pink), TbF3 (green), Dy3 (yellowish white), HoF3 (pink), ErF3 (green), TmF3 (blue), YbF3 (red), Fluorescent substances for electroluminescences, such as MnF2 (orange-red), CaWO4 :P b (blue), It Eu(s) (blue). YSiO5 -- Oe (blue), Ba, and MgAl14O23: -- Zn2SiO4:Mn (green), BaAl12O19:Mn (green), ZnAl12O19:Mn (green), CaAl12O19:Mn (green) and YBO3: -- Tb (green) and

GdBO3 : Tb (green) -- ScBO3: Fluorescent substances for plasma displays, such as Tb (green), Sr4Si3O8Cl4:Eu (green), Y2O3:Eu (red), Y2SiO5:Eu (red), and Y3aluminum5O12Eu (red), etc. are mentioned, and these fluorescent substances are used for adjustment of a color tone.

[0016] When a fluorescent substance layer can be formed by itself, it is used independently, but a binder component is used for organic [of a more than], and an inorganic fluorescent substance in order to usually raise the support nature of a fluorescent substance. About this, if it does not have a property acting as a failure in making a fluorescent substance emit light even if it is an inorganic substance, and it is the organic substance, any ingredients can be used.

[0017] As a binder component which distributes a fluorescent substance, an ingredient [being transparent (50% or more of lights)] is desirable. Polymethylmethacrylate, polyacrylate, a polycarbonate, Polyvinyl alcohol, a polyvinyl pyrrolidone, hydroxyethyl cellulose, Cull POKISHI methyl cellulose polystyrene, a styrene maleic anhydride copolymer, A styrene acrylonitrile copolymer, polyvinyl chloride, cellulose acetate butylate, Cellulose propionate, Pori alpha-naphthyl methacrylate, polyvinyl naphthalene, The Pori n-butyl methacrylate, a tetrafluoroethylene hexafluoropropylene copolymer, Poly cyclohexyl methacrylate, Pori (4-methyl pentene), The object which uses epoxy, polysulfone, a polyether ketone, polyarylate, polyimide, polyether imide, an annular olefin polymer, a polysiloxane, a benzocyclobutane polymer, water glass, a silica, titanium oxide, etc. as a component is mentioned.

[0018] The photolithography method is applicable in order to carry out separation arrangement of the fluorescent substance light wave length translator superficially like especially a dot-matrix display at each pixel. Usually, when it is said that it is easy to color a photosensitive binder etc., after distributing an organic fluorescent substance in a nonphotosensitivity binder, it is also possible [since the approach of giving photosensitivity to binder resin itself can shorten a routing counter, it is a desirable approach, but] to carry out pattern NINGU by the photolithography method. Since the configuration and its precision of a pattern will change as such a photopolymer constituent if the components differ, it is necessary to choose either suitable object of a negative mold and a positive type. Since many organic fluorescent substances may deteriorate in ultraviolet rays with strong reinforcement, it is important to select a negative mold, a positive type, or exposure conditions (the light, ultraviolet radiation, electron ray, etc.) in consideration of this point. As an ingredient which can be used for the photolithography method For example, Pori cinnamic-acid vinyl, the Pori cinnamic-acid vinyl which used the Michler's ketone for the sensitizer, Cyclized-rubber-screw azide, the cresol novolak and naphthoquinone azide which are an alkali fusibility phenol, Silicon content alkali fusibility phenol resin and naphthoquinonediazide, The poly methyl isopropenyl ketone, aromatic series screw azide, a polyvinyl phenol and diphenylsulfone diazido, An acrylic-acid system, a methacrylic-acid system, the mixture of a diazo mel drum acid and a novolak, A vinyl phenol-t-butyl carbonate polymer and the mixture of diphenyl IODONIUMU hexafluoro ASENETO, Polysilane, a polyimide system macromolecule, an acrylate system macromolecule, a polyolefine sulfone system macromolecule, an epoxy system macromolecule, a polystyrene system macromolecule, etc. are desirable. After the photosensitivity or nonphotosensitivity resin constituent which is not included or these organic fluorescent substances are included produces a film by approaches, such as a spin coat, a roll coat, a DIP coat, and the SURITODDAI coat method, butter NINGU of it can be carried out at a desired configuration. About the approach of pattern NINGU, although the photoresist method was mentioned as typical technique, it is also possible to apply a resist and to carry out pattern NINGU through the stroke of exposure, development (or sandblasting), and exfoliation, and laser ablation, dry etching, a photolysis method, etc. can be used.

[0019] In addition, print processes, an electrodeposition process, etc. can also be used for the field which became settled about the fluorescent substance as an approach of carrying out separation arrangement.

[0020] Although there is no ****** generally since the content of the organic fluorescent substance of the light wave length translator in this invention has an optimum value with each fluorescent substance, generally it is desirable to use it by 80 or less % of the weight of concentration. If there are too many contents of a fluorescent substance, since a binder component will decrease, if fluorescent substance

concentration is too high, in order for free-standing [by the binder component] to fall, or to cause a concentration-quenching phenomenon depending on a fluorescent substance, fluorescence intensity can weaken remarkably. However, neither the compound in which strong fluorescence is shown by high concentration like the fluorine permutation 9-aminoacridine, nor the compound of a certain thing to the above-mentioned content concentration which has free-standing like an alumino quinoline complex is also especially restrictive.

[0021] An object 1cm or less can use suitably the thickness of the light wave length translator containing the fluorescent substance in this invention. Furthermore, although it is more desirable to make it the thickness of 2mm or less in a thin shape and the flat-panel display with which lightweight-ization is called for, when balance with the rate of outgoing radiation of a luminescence beam of light is taken into consideration, 1-50-micrometer 0.1-100 micrometers are 1-10 micrometers still more preferably more preferably.

[0022] The fluorescent substance contained in the light wave length translator in this invention blends one kind or two kinds or more of fluorescent substances, and is used. Especially since the luminescent color has a suitable color by the application, it is not limited, but when producing a full color display, the high blue of color purity, green, and a red emitter are used preferably. Although there are some approaches about the expression approach of the suitable color, main wavelength, a CIE chromaticity coordinate, etc. of luminescence are used simple. Moreover, when light wave length translators are a monochrome display and a multicolor display, it is desirable that the fluorescent substance which colors in purple, purple-blue, yellowish green, yellow, and orange is included. Moreover, two or more of these fluorescent substances are mixed, high luminescence of color purity may be performed or luminescence of neutral colors or white may be performed.

[0023] The advantage which uses two or more fluorescent substances is remarkable especially when the wavelength of excitation light is easily unchangeable. Usually, a fluorescent substance absorbs the light of a certain specific wavelength, and emits the light of long wavelength from it. Although this is called a Stokes shift, this value is the thing of a matter proper and cannot be controlled freely. Therefore, although the fluorescent substance which carries out a very big Stokes shift is needed when making red emit light using blue glow, there are not many such [actually] fluorescent substances. Then, if the fluorescent substance which absorbs the fluorescent substance which absorbs a blue light and emits light green, and a green light, and emits light in red is made to live together when emitting light in red, blue glow is convertible for red light in two steps. Many fluorescent substances which absorb a green light and emit light in red can perform red luminescence easily from being known in case of this approach. Moreover, also in blue luminescence or green luminescence, color purity can be raised or the second fluorescent substance can be added for the purpose of raising luminous efficiency. However, it does not necessarily restrict to two kinds, and the class of fluorescent substance can also mix three or more kinds of fluorescent substances at a rate of arbitration, in order to raise luminous efficiency more, adjustment of a color, and. A fluorescent substance can also be used as it is, and may mix and use for remaining as it is or binder resin the particle which scoured the fluorescent substance, and the particle which coated the front face with the fluorescent substance. Moreover, it is possible to add an additive, in order to demonstrate the function other than a fluorescent substance or a binder to this fluorescent substance light wave length translator. For example, a silica, a titania, glass, an organic particle, talc, etc. can be made to live together, and the light absorption material which can absorb ultraviolet rays and the specific light in the semantics which prevents degradation of an organic substance and luminescence of a fluorescent substance by outdoor daylight may be made to live together as an object for light scattering for making a fluorescent substance absorb excitation light efficiently in a fluorescent substance light wave length translator. Moreover, in order to adjust the color of the light which a fluorescent substance emits, the compound which can absorb the light of specific wavelength, i.e., a pigment, and a color can also be used.

[0024] When the light wave length translator containing a fluorescent substance is used for a display, it will be processed into a suitable configuration. In monochrome luminescence, even if a fluorescent substance light wave length translator exists in the whole surface, the specific configuration with an

optical shutter device is just carried out, but it is desirable to usually prepare a fluorescent substance light wave length translator according to the configuration of an optical shutter device. Especially in the full color display of a dot matrix, like many color filters, it arranges to the field to which the organic fluorescent substance which emits light in each color was set to the light wave length translator, and is produced in the form doubled with the configuration of a pixel. Therefore, in many cases, it is not limited especially although it becomes a stripe configuration, the shape of a grid, and a delta configuration. Aiming at improvement in image quality can also be mentioned as a suitable example in the invention concerned by preparing a black field between the appointed fields where a fluorescent substance exists. This black field is called the black matrix with the color filter. What contains chromium and carbon as the quality of the material can use it as a suitable object.

[0025] The optical shutter device in this invention usually consists of the aggregate of two or more pixels. By the screen size, means of displaying, and the application, the quantity, the size, and the array method of a pixel change, and are not especially restricted to a fixed value.

[0026] Furthermore, in multicolor or a full color display, it can arrange to the field to which the light wave length translator was defined independently [two or more kinds of above-mentioned fluorescent substances], and it can enable multicolor luminescence. For example, a foreground color required for image display is taken out with the matrix drive display color display which performs graphical display of a notebook computer, and image display like television by the red of a high grade, blue, and green three-primary-colors luminescence.

[0027] In a multicolor display, it is required for a luminescence field to arrange the fluorescent substance which emits light in the defined color according to the pixel configuration of an optical shutter device. As a configuration which arranges a fluorescent substance, a segment configuration required for an information display and matrix form are mentioned, and stripe geometry, delta structure, etc. can mention as desirable gestalten in matrix form. Furthermore, in the case of a monochrome display, it is possible for what applied the emitter to homogeneity besides the above-mentioned configuration to attain the purpose of this invention.

[0028] In this invention, especially luminescence pixel size is not limited and the optimal thing is used by the application. For the above-mentioned display application, below 500-micrometer angle of the size of 1 pixel is desirable. Furthermore, 100x300 micrometers which is the 1 pixel size of monochrome of the liquid crystal display put in practical use now as suitable pixel size can be illustrated. Moreover, in order to raise contrast among these pixels, it is desirable that the black field called a black matrix (BM) exists. BM makes black the clearance between the luminescence fields containing a fluorescent substance, i.e., a pixel, and makes an image legible. As the quality of the material of BM, chromium, carbon, carbon, or the resin that distributed the black matter in addition to this is used.

[0029] Although the light wave length translator from which the light wave length translator in this invention changes the light from the light source into other wavelength is used preferably, the part in which the light wave length translator which displays the light from the light source as it is depending on the case is formed may exist. When blue glow is excitation light as an example, blue glow is made to penetrate as it is, and performs luminescence of green and red by blue glow. On the other hand, it is also possible to use it combining two or more light wave length translators.

[0030] The optical shutter device in this invention can switch most preferably 390-500nm of a part of 440-500nm light or the light of full wave length the emission center wavelength of 390-700nm used by this invention. Although it changes with target displays and there is no ****** generally about the quantity and size of an optical shutter device, on the display used for the above-mentioned display application, for example, below 500-micrometer angle of the size of 1 pixel is desirable. Furthermore, on a 10 inch small full color display, 640x3x480 can illustrate the number of pixels, and about 100x300 micrometers can illustrate size as one of the good better sizes. Moreover, in a flat-panel display, in order to perform a gradation display, the thing which makes the light transmittance of a pixel change with electric control to any value can use suitably. The absolute value of light transmittance, the contrast of the change, and rate responsibility are so desirable that they are high. Although the thickness of an optical shutter device has a useful thing 5cm or less, if thin-shape-izing and lightweight-ization are taken

into consideration, it is desirable that it is 1cm or less. As an example of the optical shutter device in which these requirements are satisfied TFT, STN, strong dielectricity, antiferroelectric, the guest host using dichroic coloring matter, Transparency mold liquid crystal optical shutter devices and tungstic oxide, such as a PDN method which is polymer distributed process input output equipment, Although erection clo MIKKU, chemical clo MIKKU, etc. which are represented by oxidization iridium, Prussian blue, a viologen derivative, TTF-polystyrene, a rare earth metal-JIFUTARO cyanine complex, the poly thiophene, the poly aniline, etc. are mentioned Especially, a liquid crystal module is characterized by the thin shape, the light weight, and the low power, has practical endurance and is suitably used from the densification of a segment being possible. In this, especially a desirable thing is the guest host who used the liquid crystal of a TFT active-matrix drive, and dichroic coloring matter. since a polarizing plate is not required for the reason in that the problem of the high-speed responsibility corresponding to an animation or a cross talk does not occur in the active matrix which used the torsion nematic liquid crystal, and guest host liquid crystal -- attenuation of the light from the light source -- few -- high -- it is because brightness luminescence is attained.

[0031] The component which changes the electrical energy in this invention into light is a component which emits the light for carrying out optical pumping of the fluorescent substance contained in a light wave length translator with electrical energy, and the false side-like light emitting device with which the light guide plate for not only the light source that shape[of a field]-emits light but the light source, and optical diffusion etc. was combined is contained. 390-700nm of 390-500nm of main wavelength is 440-500nm light most preferably, and, as for the emission light which the component which changes such electrical energy into light emits, the light source to which a luminescence peak exists in this field is used. However, as for the number of the peaks in the range, especially a limit does not have one or at least two or more. Namely, the luminescence peak which can excite at least one or more fluorescent substances in this field should just exist. Furthermore, in a flat-panel display, especially the component that emits uniform sheet-like light among the components which change electrical energy into light is useful. As a component which emits uniform sheet-like light, the component which changes into sheet-like light the light taken out from the light source of the configuration of not only a component but one or more arbitration where the component itself is formed in one or more sources of field luminescence using suitable technique, such as a light guide, and diffusion, reflection, is also contained. Moreover, the component which combined such technique can also be used. It is desirable still more desirable that it is 5cm or less from a practical standpoint, and the thickness of the component which changes the electrical energy for flat-panel displays into light is 5mm or less.

[0032] As a component which changes electrical energy into field-like light among the components which change electrical energy into light, the field luminescence LED using the inorganic intrinsic EL component, an organic EL device, a small flat-surface fluorescent lamp, and an inorganic semi-conductor etc. is mentioned, for example.

[0033] Moreover, the component which changes into sheet-like light the light taken out from the light source among the components which change electrical energy into light is constituted by the translator to the light source and field-like luminescence.

[0034] As the light source of the component which changes into sheet-like light the light taken out from the light source, the electroluminescent light sources, such as various lamps, such as a halogen lamp, a mercury lamp, a hydrogen discharge tube, a neon glow lamp, a xenon lamp, a low-pressure sodium lamp, and a fluorescent lamp, the inorganic semi-conductor LED, and an organic EL device, etc. are mentioned, for example. Since various wavelength spectrums are obtained by choosing a fluorescent substance, especially the fluorescent lamp that makes a fluorescent substance emit light by the ultraviolet radiation generated from low voltage discharge of mercury has a large degree of freedom, there is comparatively little power consumption, and it is desirable especially from a small thing.

[0035] Optical diffusion devices, such as a pattern with which reflex systems and TiO2 system compounds, such as light guide plates, such as a quartz plate, a glass plate, and an acrylic board, and aluminum sheet, various metal vacuum evaporationo film, were used for the translator to field-like luminescence of the light taken out from the light source, an optical diffusion sheet, and optical

diffusion prism, consist of independence and the thing which had plurality combined preferably. Especially the translator to the sheet-like light which consists of a light guide plate, a reflecting plate, and a diffusion plate is suitably used in this invention, and can also use suitably the translator currently used for the liquid crystal display application etc. As the useful light source, a fluorescent lamp and the inorganic semi-conductor LED can be illustrated to this invention in these. Although the cold cathode tube and hot cathode tube which are used conventionally can be used for a fluorescent lamp, if the white light is used, in order that other colors may mix in blue, green, and a red luminescence field, it is desirable to take out only the blue field in the white light using a filter etc. Furthermore, if the fluorescent lamp which applied only the blue fluorescent substance is used preferably, it is effective for power consumption reduction. Moreover, since the blue of high brightness and the white inorganic semi-conductor LED can come to hand recently, use of the back light which used these light sources is also possible. Especially the blue inorganic semi-conductor LED can be suitably used from the ability of the light in a desirable wavelength field to be alternatively emitted to this invention.

[0036] The radical headquarters material of the invention in this application is a fluorescent substance light wave length translator, an optical shutter device, and the light source. An optical shutter device consists of a polarizing plate (polarizer), an electrode, liquid crystal, an electrode, and a polarizing plate (analyzer) fundamentally. Although there are two kinds of this (2) light emitting device as shown in (1) light emitting device, a fluorescence layer, a polarizing plate (polarizer), an electrode, liquid crystal, an electrode, a polarizing plate (analyzer), and drawing 1 in order of a configuration, a polarizing plate (polarizer), an electrode, liquid crystal, an electrode, a polarizing plate (analyzer), and a fluorescence layer Since, as for the approach of (1), fluorescence in three primary colors forms an image through a liquid crystal device, the problem of the conventional angle of visibility is unsolvable, but in order that, as for the approach of of (2) which has a fluorescent substance in an image display side, the light which penetrated liquid crystal may shine a fluorescent substance, it is uniform and the display of a light emission without an angle-of-visibility dependency is attained.

[0037] The more concrete configuration of (2) is shown in drawing 2 -5. Drawing 2 forms the black matrix 22 on a glass substrate 1, and produces the fluorescent substance pixels 19-21 which emit light in each color. And after attaching a polarizing plate 23, a transparent electrode (ITO) 24 is made. The light wave length translator shown in drawing 3 makes the ITO substrate which made the transparent electrode 32 form on a glass substrate 25 on the black matrix 29, the thing which made the fluorescence pixels 26-28, a polarizing plate 30, and a glass substrate 31 rival like drawing 2 . The light wave length translator shown in drawing 4 forms a polarizing plate 38 in the tooth back of the ITO substrate which made the ITO transparent electrode 40 form on a glass substrate 39, and after it makes the black matrix 37 and the fluorescence pixels 34-36 further, it makes a protective coat 33 (this has functions, such as blemish prevention and a specific wavelength cut) form. On the ITO substrate which made the ITO transparent electrode 49 form on a glass substrate 48, a polarizing plate 47, and a glass substrate 46, the light wave length translator shown in drawing 5 makes the black matrix 45 and the fluorescent substance pixels 42-44, and is equipped with a specific wavelength cut or the acid-resisting device 41 at the tooth-back side of lump glass. When anxious about the contrast fall by the horizontal leakage of the light which emitted light although the black matrix was written in these lower than a fluorescent substance, as for the height of a black matrix, it is desirable that it is higher than a fluorescent substance. Moreover, since an organic fluorescent substance can emit polarization by the solid state, when polarization can be emitted in the fixed direction to incidence polarization, as shown in drawing 6 , a polarizing plate as well as the usual color filter can be located in the outermost layer, and production of a display becomes easy. Although polarization is emitted also by mere spreading, the organic fluorescent substance is more effective to generate polarization more efficient if a fluorescent substance is put in order in the fixed direction. The approach of carrying out rubbing of the fluorescent substance applied as the approach, the approach of applying a fluorescent substance on the substrate by which rubbing was carried out, the approach that is mixed with the liquid crystal matter and applies a fluorescent substance, the method of using LB film, etc. are raised.

[0038]

[Example] This invention is not limited by these, although an example and the example of a comparison are raised to below and this invention is explained to it.
[0039] The orientation film was formed in the TFT substrate corresponding to VGA of 10 inches of example 1 vertical angles, and rubbing processing was performed. After applying a sealing compound, the spacer has been arranged, alignment of the ITO glass substrate (it is ITO by the spatter on the soda lime glass which gave barrier coating sealant film production and field resistance 7ohm/**) in which the orientation film was formed was carried out, and heat hardening of the sealing compound was carried out. Liquid crystal was poured in after that, the ultraviolet-rays curing agent closed the inlet, and the polarizing plate was stuck. That by which the polyimide layer with a thickness of 5 micrometers which contains perylene to a blue luminescence field and contains an aluminum quinolinol complex and the fluorescent substance of dimethylamino phenyl ethynyl MECHIRUPIRANIRIDEMPUROPAN dinitrile (DCM1) in an aluminum quinolinol complex and a red luminescence field to a green luminescence field was formed as a light wave length translator on the glass substrate was produced, and it has arranged so that it may correspond to each pixel of TFT. Next, the side light mold back light which used the monochrome fluorescent lamp in the main wavelength of 450nm was installed. Thus, the produced spontaneous light display does not have the dependency of an angle of visibility, and emitted light in high brightness.
[0040] As a fluorescent substance contained in an example 2 light-wave length translator, except having used the coumarin 4 for the blue luminescence field, and having used an aluminum quinolinol complex, and Pyrromethene580 and Pyrromethene620 for the green luminescence field in the aluminum quinolinol complex, the coumarin 540, and the red luminescence field, when the display experiment was conducted like the example 1, it was clear and full color image display without an angle-of-visibility dependency was able to be performed.
[0041] Except having used the tetra-phenyl butadiene for the blue luminescence field as a fluorescent substance contained in an example 3 light-wave length translator, when the display experiment was conducted like the example 1, it was clear and full color image display without an angle-of-visibility dependency was able to be performed.
[0042] The polyimide layer with a thickness of 5 micrometers which contains perylene to a blue luminescence field and contains an aluminum quinolinol complex and the fluorescent substance of dimethylamino phenyl ethynyl MECHIRUPIRANIRIDEMPUROPAN dinitrile (DCM1) in an aluminum quinolinol complex and a red luminescence field to a green luminescence field was formed as a light wave length translator on the example 4 glass substrate (Corning 7059). Besides the polarization film was stretched and ITO was produced by the spatter. This field resistance of ITO was 10ohm/**. Besides the orientation film was formed further and rubbing processing was performed. Thus, when the display was produced by the same approach as an example 1 except for not carrying out forming a fluorescent substance light wave length translator in the outside of a liquid crystal shutter device for the obtained light wave length translator, it was clear and full color image display without an angle-of-visibility dependency was able to be performed.
[0043] the place which used Sr10(PO4) 6Cl2:Eu as an example of comparison 1 blue fluorescent substance, used 6 MgO-As2O5:Mn as SrAl2O4:Eu and a red emitter as a green fluorescent substance, and was produced by the same approach as an example 1 except that the wavelength of the light source was 380nm -- brightness -- low -- color purity -- being low -- only the display was completed.
[0044]
[Effect of the Invention] The spontaneous light display which consists of a component which changes the light wave length translator containing the organic fluorescent substance of this invention, an optical shutter device, and electrical energy into light As a thin shape without an angle-of-visibility dependency, lightweight monochrome, and a full color display A personal computer, a monitor, a word processor, a Personal Digital Assistant, a mobile phone, Television, a video camera, a cassette recorder, CD recorder, a laser disc, It is useful as a thin shape and a lightweight display to OA and the public welfare devices for household electric appliances, such as a stereo, a videocassette recorder, a camera, a car stereo, a car-navigation system, and a karaoke system, a public display device, etc.

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TECHNICAL FIELD

[Field of the Invention] This invention relates to the spontaneous light display which can perform a segment display or a matrix display especially about the spontaneous light display which consists of a light emitting device which changes the light wave length translator containing a fluorescent substance, an optical shutter device, and electrical energy into light. The spontaneous light display of this invention is useful as a thin shape and a lightweight display to OA and the public welfare devices for household electric appliances, such as a personal computer, a monitor, a word processor, a Personal Digital Assistant, a mobile phone, television, a video camera, a cassette recorder, CD recorder, a laser disc, a stereo, a videocassette recorder, a camera, a car stereo, a car-navigation system, and a karaoke system, a public display device, etc.

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PRIOR ART

[Description of the Prior Art] There are strong dielectric liquid crystal besides the STN method with which high definition, the TFT liquid crystal which can respond even to a movie display by high-speed response, and current or the becoming improvement in the engine performance is found, antiferroelectric liquid crystal, guest host liquid crystal using dichroism coloring matter, etc. as liquid crystal. in recent years, liquid crystal displays are a thin shape, a light weight, and low power consumption as compared with the conventional CRT -- etc. -- it has spread quickly according to the description.
[0003] However, since the current liquid crystal display is controlling the light of a back light by the liquid crystal shutter, when image quality change is carried out and it sees from [four directions] across with an angle of visibility, image quality deteriorates greatly. Especially in the color display as which high definition, such as a notebook computer and television, is required, the angle-of-visibility dependency poses a big problem. In order to solve this problem, various approaches, such as the division orientation method for giving current [current / of orientation], for example, the direction which is different in the divided pixel, a pixel split plot experiment which gives an electrical-potential-difference - permeability property which is different in the divided pixel, and an approach using an optical compensating plate, are proposed, the transmitted light is extended to whenever [wide-angle], the reversal when seeing from four directions and a contrast fall control, and image-quality maintenance is performing.
[0004] The display of spontaneous light, such as CRT, an electro luminescent display, an organic electro luminescent display, a plasma display, Flat CRT, a fluorescent indicator tube, and LED, is accepted as a good display of visibility by the display of spontaneous light effective in controlling the image quality change by the angle of visibility, and raising visibility. However, the conventional spontaneous light display had various faults as compared with the liquid crystal display, and needed to be improved. For example, since CRT made glass the quality of the material, it was heavy, and since depth was required, it had the fault which takes a location. Moreover, its driver voltage was very as high as more than 100V, and since blue luminescence of high brightness of an electro luminescent display was not completed, full-color-izing was difficult for it. The improvement in dependability of highly minute pixel formation being difficult for an organic electro luminescent display and a component is a technical problem. Furthermore, power consumption of the plasma display was high and highly minute-ization of it was not completed on a small display 20 inches or less. Although Flat CRT is a thin shape compared with the conventional CRT, the fault of being heavy is not solved in a big screen. The fluorescent indicator tube is inferior in respect of big-screen[highly-minute-izing and]-izing and full-color-izing compared with the liquid crystal display. Production of a field-like illuminant is difficult for LED, and cannot apply it to the display display for OA. Thus, although the conventional spontaneous light display was excellent in visibility, when using it as a display, it had various faults. As current and a flat-panel display, the visual field expansion advanced type liquid crystal display is examined rather than the direction which improves a spontaneous light display in many cases.
[0005] However, advanced ultra-fine processing technology is required for the angle-of-visibility expansion technique of the conventional liquid crystal display, it is bad, and is high. [of cost] [of the

yield] Moreover, even if it extended the angle of visibility in the present condition, the screen could be seen [no] from include angles, but fundamental solution was difficult.
[0006] Then, the approach of compensating a fault in the range in which a spontaneous light display does not spoil the outstanding description, either is examined. The example in an organic electro luminescent display is given. Although it is necessary to full-color-izing of an organic electroluminescence to form a very detailed pixel, a damage will be given to a component in pattern NINGU which uses a resist etc. in order to use the organic substance. Therefore, having acquired the property practical now is restricted to the monochrome display. In order to solve this problem, by arranging the color translator which used the fluorescent substance for the front face of the monochrome display which performs blue luminescence, displaying green and red with energy lower than blue is devised (JP,3-152897,A, JP,5-258860,A, JP,8-222369,A, JP,8-279394,A). Furthermore, the component (JP,6-267301,A) which has arranged the fluorescent substance in the front face of the component which emits the ultraviolet rays of short wavelength is also known. However, as for these techniques, by the ultraviolet-rays light emitting device, the optical output is very small and the problem of a short paddle also in a component life fully [the dependability of the component life of an organic electroluminescence element in which blue luminescence which is the light source is possible, a resistance to environment, and a component property] remains.
[0007] Then, in the liquid crystal display excellent in a life and endurance, in order to solve a problem of low efficiency for light utilization, a problem of an angle of visibility, etc. which used the conventional color filter, some examination has been made. preparing a fluorescent substance layer in three primary colors in the configuration corresponding to each pixel in improvement in the use effectiveness of light at the optical incidence side of the liquid crystal shutter of the conventional back light method liquid crystal display -- high -- the approach of performing a brightness display (JP,63-15221,A, JP,8-36175,A), and the method (JP,7-325392,A) of making a fluorescent substance mix into a color filter are devised.
[0008] However, since the problem of an angle of visibility is unsolvable with this technique, the angle-of-visibility dependency of a liquid crystal display is abolished, and examination that a technical problem will be solved by the approach (JP,6-14247,B, JP,7-253576,A, JP,8-62602,A) of using a fluorescent substance instead of the pigment of the color filter conventional for the purpose of raising color purity by high brightness or a color is made.

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EFFECT OF THE INVENTION

[Effect of the Invention] The spontaneous light display which consists of a component which changes the light wave length translator containing the organic fluorescent substance of this invention, an optical shutter device, and electrical energy into light As a thin shape without an angle-of-visibility dependency, lightweight monochrome, and a full color display A personal computer, a monitor, a word processor, a Personal Digital Assistant, a mobile phone, Television, a video camera, a cassette recorder, CD recorder, a laser disc, It is useful as a thin shape and a lightweight display to OA and the public welfare devices for household electric appliances, such as a stereo, a videocassette recorder, a camera, a car stereo, a car-navigation system, and a karaoke system, a public display device, etc.

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MEANS

[Means for Solving the Problem] In order that this invention persons may attain the above-mentioned purpose, as a result of inquiring wholeheartedly, liquid crystal equipment with endurance and dependability practical as an optical shutter is used. By preparing the light wave length translator containing the organic fluorescent substance which can emit light in blue, green, and red with at least one or more kinds of light of the field whose main wavelength is 390-700nm instead of the conventional color filter When the special light source like ultraviolet rays was not needed but the problem of a raise in an angle of visibility and the improvement in a life was able to be solved at once, header this invention was reached [that the high display of color purity is attained, and].
[0013]
[Embodiment of the Invention] The organic fluorescent substance is contained in the light wave length translator in this invention, and in order to display one color, one kind or two kinds or more of fluorescent substances are contained. Therefore, in order to make a color display possible, three kinds, blue, green, and red, are required at the lowest, and the fluorescent substance beyond it may be contained in order to raise color purity and luminescence brightness. However, since the light by which outgoing radiation is carried out from a light emitting device in order to excite a fluorescent substance can be used as it is, for example, when blue glow is used as the light source, the minimum number of fluorescent substance use becomes two kinds. It is the description that the light can be emitted by at least one or more kinds of light this light wave length translator's containing the organic fluorescent substance and whose main wavelength are 390-700nm. Usually, since luminescent color conversion in the color of energy with an expensive fluorescent substance cannot be performed, when obtaining three primary colors for color display, as for the emission center wavelength of the light source, it is desirable to go into the range of 390-500nm, and it is 440-500nm most preferably. using an organic fluorescent substance in this invention -- the long wave of a wavelength region -- it says that a merit side is 500nm -- visual -- bluish green - it can be used as the light source to the field which looks green. It is because there is a fact that the fluorescent substance of a specific combination, for example, a bis(2-methyl-8-quinolinolato) BIFENORATO aluminum complex, and the mixture of perylene can change the light near 500nm into blue luminescence of high color purity.
[0014] A fluorescent substance indispensable to this invention is the quality of organic. Since the reason is excited by the light and can emit the light, it is not using the ultraviolet rays which cause many failures for the light source. Many organic substance can absorb the light of a blue field, and can emit the light of blue, green, and red. By combining with the fluorescent substance with which the fluorescent substance which absorbs the light of metaphor green and emits red also absorbs blue, and emits green, it is possible to also make red emit light, making energy transfer cause using a blue light. Thus, an organic fluorescent substance can perform three-primary-colors luminescence easily using the light of being blue, and has the description that fine tuning of a color tone is attained easily, by adjusting the chemical structure. Therefore, although use of an organic fluorescent substance is indispensable in this invention, various matter as what suits this invention is known. Although this invention shows an usable desirable organic fluorescent substance below, it is not the object limited to these. As an example, naphthalene, an

anthracene, a phenanthrene, a chrysene, Perylene, triphenylene, a pyrene, an acenaphthene, a fluorene, a biphenyl, Terphenyl, diphenyl benzene, quarter phenyl, a diphenyl anthracene, Aromatic hydrocarbon system compounds, such as rubrene and its substitution product, diaryl ethylene, A diaryl polyene, allyl compound permutation vinylbenzene, 1, 4-bis(2-methyl styryl) benzene, Still pen system coloring matter, such as a transformer -4 and a 4'-diphenyl still pen, a 7-hydroxy-4-methyl coumarin (coumarin 4), A coumarin 153, a coumarin 6, a coumarin 7, a coumarin 120, a coumarin 2, a coumarin 339, a coumarin 1, a coumarin 138, a coumarin 106, a coumarin 102, coumarin 314T, The coumarin coloring matter of a coumarin 338, a coumarin 151, a coumarin 4, a coumarin 314, a coumarin 30, a coumarin 500, a coumarin 307, a coumarin 334, a coumarin 343, and coumarin 337 grade, Although it is another coumarins pigment system color, the North America Free Trade Agreement RUIMIDO coloring matter of the BASIC yellow 51 and the SORUPENTOI yellow 11, and SORUPENTOI yellow 116 grade, An allyl compound acetylene series compound, a furan, a thiophene, a pyrrole, benzofuran, Phthalocyanine derivatives, such as a metal phthalocyanine represented by benzothiophene, Indore and those derivatives, a porphyrin, and the copper phthalocyanine or a non-metal phthalocyanine, the diaza represented by PYRROMRTHENE 650, 546, 556, 567, 580, and 597 which can come to hand at EXCITON -- a bora -- an indacene derivative -- Allyl compound permutation oxazole, OKISA diazole, thiadiazole, benzoxadiazole, Five membered ring heterocyclic compounds, such as benzothiadiazole, those derivatives, and allyl compound permutation pyrazoline, pyrazoles, those derivatives, A quinoline, an isoquinoline, benzoquinoline, phenanthridine and those derivatives, Pyrazine, pyridazine, a pyrimidine, quinoxaline, phenazine, quinazoline, Six membered ring heterocyclic compounds, such as a phenanthroline, Quinacridone, pyrenes, and those derivatives, A fluorescein, dichlorofluorescein, a rhodamine 110, rhodamine 6G tetra-FURORO borate, Rhodamine 6G, rhodamine 6G perchlorate, rhodamine 19 perchlorate, Rhodamine system derivatives, such as rhodamines, such as Rhodamine B, sulfo Rhodamine B, and the sulfo rhodamine 101, The pyronin, a bends xanthene, benzodioxane and its derivative, oxazine 170 perchlorate that has two different hetero atoms in a ring, Oxazine 1 perchlorate, NIRU blue A perchlorate, the oxazine derivative represented by NIRU red, Oxygen content heterocyclic compounds, such as a phenothiazine derivative and a FENO oxazine derivative, alpha, beta-partial saturation ketone, an anthrone, benzanthrone, anthra pyridone, an oxazole anthra pyridine and full -- me -- non, benzoquinoline, and a naphthoquinone -- As anthraquinone, a naphthacene quinone, hepta-SENKINON, pyran TRON, KARUBO styryl, oxazolone, indigo, thioindigoes, those derivatives, and a naphthalic acid compound Acetylamino naphthalic acid, North America Free Trade Agreement RUIMIDO, phenylhydrazine, Carbonyl content compounds, such as perylene tetracarboxylic acid, naphth xylene benzimidazole, and those derivatives, Cyanine system coloring matter, such as a metal complex with quinolinol and a flavonol derivative, and a 4-dicyanomethylene-2-methyl-4-dicyanomethylene-4-dicyanomethylene-2-methyl-6-(p-dimethylaminostyryl)-4H-bilane (DCM), Quinolinol derivatives, such as tris (8-quinolinolato) aluminum and bis(2-methyl-8-quinolinolato) pyridino RATOARU minium, etc. are mentioned.

[0015] In this invention, although use of an organic fluorescent substance is indispensable, the inorganic fluorescent substance, the pigment, the color, etc. may be included. for example, as an organic fluorescent substance and an inorganic compound usable together as a fluorescent substance A phosphoric acid salt (Sr, Mg) (32(PO4):Sn2+ (orange-red color)), Germane acid chloride (4MgO-GeO2:Mn4+ (deep red)), yttrium acid chloride (Y2 O3:Eu3+ (red)), A vanadate (Y, VO4:Eu3+ (red)), a halo silicic-acid salt (Sr2Si3O8and2SrCl2:Eu2+ (bluish green color)), Fluorescent substances for high pressure mercury fluorescent lamps, such as an aluminate (Ba, Mg) (2aluminum16O24:Eu2+(blue);(Ba, Mg) 2aluminum16O24:Eu2+, Mn2+(green);Y2O3andaluminum2O3:Tb3+ (yellowish green)), ZnS:Ag (blue), ZnS:Au, Cu and aluminum (green), ZnS:Cu, aluminum (green), Fluorescent substances for CRT, such as Y2O2S:Eu3+ (red), ZnO:Zn (green), ZnS: [Zn]+In 2O3 (blue), ZnS:Cu, aluminum+In 2O3 (********), ZnS:Au, aluminum+In 2O3 (yellowish green), S:Au (Zn 0.9, Cd0.1), Fluorescent substances for fluorescent indicator tubes, such as aluminum+In 2O3, PrF3 (white), NdF3 (sour orange), SmF3 (orange-red), EuF3 (pink), TbF3 (green), Dy3 (yellowish white), HoF3 (pink), ErF3 (green), TmF3 (blue), YbF3 (red), Fluorescent substances for electroluminescences, such as MnF2 (orange-red),

CaWO4 :P b (blue), It Eu(s) (blue). YSiO5 -- Oe (blue), Ba, and MgAl14O23: -- Zn2SiO4:Mn (green), BaAl12O19:Mn (green), ZnAl12O19:Mn (green), CaAl12O19:Mn (green) and YBO3: -- Tb (green) and GdBO3 : Tb (green) -- ScBO3: Fluorescent substances for plasma displays, such as Tb (green), Sr4Si3O8Cl4:Eu (green), Y2O3:Eu (red), Y2SiO5:Eu (red), and Y3aluminum5O12Eu (red), etc. are mentioned, and these fluorescent substances are used for adjustment of a color tone.

[0016] When a fluorescent substance layer can be formed by itself, it is used independently, but a binder component is used for organic [of a more than], and an inorganic fluorescent substance in order to usually raise the support nature of a fluorescent substance. About this, if it does not have a property acting as a failure in making a fluorescent substance emit light even if it is an inorganic substance, and it is the organic substance, any ingredients can be used.

[0017] As a binder component which distributes a fluorescent substance, an ingredient [being transparent (50% or more of lights)] is desirable. Polymethylmethacrylate, polyacrylate, a polycarbonate, Polyvinyl alcohol, a polyvinyl pyrrolidone, hydroxyethyl cellulose, Cull POKISHI methyl cellulose polystyrene, a styrene maleic anhydride copolymer, A styrene acrylonitrile copolymer, polyvinyl chloride, cellulose acetate butylate, Cellulose propionate, Pori alpha-naphthyl methacrylate, polyvinyl naphthalene, The Pori n-butyl methacrylate, a tetrafluoroethylene hexafluoropropylene copolymer, Poly cyclohexyl methacrylate, Pori (4-methyl pentene), The object which uses epoxy, polysulfone, a polyether ketone, polyarylate, polyimide, polyether imide, an annular olefin polymer, a polysiloxane, a benzocyclobutane polymer, water glass, a silica, titanium oxide, etc. as a component is mentioned.

[0018] The photolithography method is applicable in order to carry out separation arrangement of the fluorescent substance light wave length translator superficially like especially a dot-matrix display at each pixel. Usually, when it is said that it is easy to color a photosensitive binder etc., after distributing an organic fluorescent substance in a nonphotosensitivity binder, it is also possible [since the approach of giving photosensitivity to binder resin itself can shorten a routing counter, it is a desirable approach, but] to carry out pattern NINGU by the photolithography method. Since the configuration and its precision of a pattern will change as such a photopolymer constituent if the components differ, it is necessary to choose either suitable object of a negative mold and a positive type. Since many organic fluorescent substances may deteriorate in ultraviolet rays with strong reinforcement, it is important to select a negative mold, a positive type, or exposure conditions (the light, ultraviolet radiation, electron ray, etc.) in consideration of this point. As an ingredient which can be used for the photolithography method For example, Pori cinnamic-acid vinyl, the Pori cinnamic-acid vinyl which used the Michler's ketone for the sensitizer, Cyclized-rubber-screw azide, the cresol novolak and naphthoquinone azide which are an alkali fusibility phenol, Silicon content alkali fusibility phenol resin and naphthoquinonediazide, The poly methyl isopropenyl ketone, aromatic series screw azide, a polyvinyl phenol and diphenylsulfone diazido, An acrylic-acid system, a methacrylic-acid system, the mixture of a diazo mel drum acid and a novolak, A vinyl phenol-t-butyl carbonate polymer and the mixture of diphenyl IODONIUMU hexafluoro ASENETO, Polysilane, a polyimide system macromolecule, an acrylate system macromolecule, a polyolefine sulfone system macromolecule, an epoxy system macromolecule, a polystyrene system macromolecule, etc. are desirable. After the photosensitivity or nonphotosensitivity resin constituent which is not included or these organic fluorescent substances are included produces a film by approaches, such as a spin coat, a roll coat, a DIP coat, and the SURITODDAI coat method, butter NINGU of it can be carried out at a desired configuration. About the approach of pattern NINGU, although the photoresist method was mentioned as typical technique, it is also possible to apply a resist and to carry out pattern NINGU through the stroke of exposure, development (or sandblasting), and exfoliation, and laser ablation, dry etching, a photolysis method, etc. can be used.

[0019] In addition, print processes, an electrodeposition process, etc. can also be used for the field which became settled about the fluorescent substance as an approach of carrying out separation arrangement.

[0020] Although there is no ****** generally since the content of the organic fluorescent substance of the light wave length translator in this invention has an optimum value with each fluorescent substance,

generally it is desirable to use it by 80 or less % of the weight of concentration. If there are too many contents of a fluorescent substance, since a binder component will decrease, if fluorescent substance concentration is too high, in order for free-standing [by the binder component] to fall, or to cause a concentration-quenching phenomenon depending on a fluorescent substance, fluorescence intensity can weaken remarkably. However, neither the compound in which strong fluorescence is shown by high concentration like the fluorine permutation 9-aminoacridine, nor the compound of a certain thing to the above-mentioned content concentration which has free-standing like an alumino quinoline complex is also especially restrictive.

[0021] An object 1cm or less can use suitably the thickness of the light wave length translator containing the fluorescent substance in this invention. Furthermore, although it is more desirable to make it the thickness of 2mm or less in a thin shape and the flat-panel display with which lightweight-ization is called for, when balance with the rate of outgoing radiation of a luminescence beam of light is taken into consideration, 1-50-micrometer 0.1-100 micrometers are 1-10 micrometers still more preferably more preferably.

[0022] The fluorescent substance contained in the light wave length translator in this invention blends one kind or two kinds or more of fluorescent substances, and is used. Especially since the luminescent color has a suitable color by the application, it is not limited, but when producing a full color display, the high blue of color purity, green, and a red emitter are used preferably. Although there are some approaches about the expression approach of the suitable color, main wavelength, a CIE chromaticity coordinate, etc. of luminescence are used simple. Moreover, when light wave length translators are a monochrome display and a multicolor display, it is desirable that the fluorescent substance which colors in purple, purple-blue, yellowish green, yellow, and orange is included. Moreover, two or more of these fluorescent substances are mixed, high luminescence of color purity may be performed or luminescence of neutral colors or white may be performed.

[0023] The advantage which uses two or more fluorescent substances is remarkable especially when the wavelength of excitation light is easily unchangeable. Usually, a fluorescent substance absorbs the light of a certain specific wavelength, and emits the light of long wavelength from it. Although this is called a Stokes shift, this value is the thing of a matter proper and cannot be controlled freely. Therefore, although the fluorescent substance which carries out a very big Stokes shift is needed when making red emit light using blue glow, there are not many such [actually] fluorescent substances. Then, if the fluorescent substance which absorbs the fluorescent substance which absorbs a blue light and emits light green, and a green light, and emits light in red is made to live together when emitting light in red, blue glow is convertible for red light in two steps. Many fluorescent substances which absorb a green light and emit light in red can perform red luminescence easily from being known in case of this approach. Moreover, also in blue luminescence or green luminescence, color purity can be raised or the second fluorescent substance can be added for the purpose of raising luminous efficiency. However, it does not necessarily restrict to two kinds, and the class of fluorescent substance can also mix three or more kinds of fluorescent substances at a rate of arbitration, in order to raise luminous efficiency more, adjustment of a color, and. A fluorescent substance can also be used as it is, and may mix and use for remaining as it is or binder resin the particle which scoured the fluorescent substance, and the particle which coated the front face with the fluorescent substance. Moreover, it is possible to add an additive, in order to demonstrate the function other than a fluorescent substance or a binder to this fluorescent substance light wave length translator. For example, a silica, a titania, glass, an organic particle, talc, etc. can be made to live together, and the light absorption material which can absorb ultraviolet rays and the specific light in the semantics which prevents degradation of an organic substance and luminescence of a fluorescent substance by outdoor daylight may be made to live together as an object for light scattering for making a fluorescent substance absorb excitation light efficiently in a fluorescent substance light wave length translator. Moreover, in order to adjust the color of the light which a fluorescent substance emits, the compound which can absorb the light of specific wavelength, i.e., a pigment, and a color can also be used.

[0024] When the light wave length translator containing a fluorescent substance is used for a display, it

will be processed into a suitable configuration. In monochrome luminescence, even if a fluorescent substance light wave length translator exists in the whole surface, the specific configuration with an optical shutter device is just carried out, but it is desirable to usually prepare a fluorescent substance light wave length translator according to the configuration of an optical shutter device. Especially in the full color display of a dot matrix, like many color filters, it arranges to the field to which the organic fluorescent substance which emits light in each color was set to the light wave length translator, and is produced in the form doubled with the configuration of a pixel. Therefore, in many cases, it is not limited especially although it becomes a stripe configuration, the shape of a grid, and a delta configuration. Aiming at improvement in image quality can also be mentioned as a suitable example in the invention concerned by preparing a black field between the appointed fields where a fluorescent substance exists. This black field is called the black matrix with the color filter. What contains chromium and carbon as the quality of the material can use it as a suitable object.

[0025] The optical shutter device in this invention usually consists of the aggregate of two or more pixels. By the screen size, means of displaying, and the application, the quantity, the size, and the array method of a pixel change, and are not especially restricted to a fixed value.

[0026] Furthermore, in multicolor or a full color display, it can arrange to the field to which the light wave length translator was defined independently [two or more kinds of above-mentioned fluorescent substances], and it can enable multicolor luminescence. For example, a foreground color required for image display is taken out with the matrix drive display color display which performs graphical display of a notebook computer, and image display like television by the red of a high grade, blue, and green three-primary-colors luminescence.

[0027] In a multicolor display, it is required for a luminescence field to arrange the fluorescent substance which emits light in the defined color according to the pixel configuration of an optical shutter device. As a configuration which arranges a fluorescent substance, a segment configuration required for an information display and matrix form are mentioned, and stripe geometry, delta structure, etc. can mention as desirable gestalten in matrix form. Furthermore, in the case of a monochrome display, it is possible for what applied the emitter to homogeneity besides the above-mentioned configuration to attain the purpose of this invention.

[0028] In this invention, especially luminescence pixel size is not limited and the optimal thing is used by the application. For the above-mentioned display application, below 500-micrometer angle of the size of 1 pixel is desirable. Furthermore, 100x300 micrometers which is the 1 pixel size of monochrome of the liquid crystal display put in practical use now as suitable pixel size can be illustrated. Moreover, in order to raise contrast among these pixels, it is desirable that the black field called a black matrix (BM) exists. BM makes black the clearance between the luminescence fields containing a fluorescent substance, i.e., a pixel, and makes an image legible. As the quality of the material of BM, chromium, carbon, carbon, or the resin that distributed the black matter in addition to this is used.

[0029] Although the light wave length translator from which the light wave length translator in this invention changes the light from the light source into other wavelength is used preferably, the part in which the light wave length translator which displays the light from the light source as it is depending on the case is formed may exist. When blue glow is excitation light as an example, blue glow is made to penetrate as it is, and performs luminescence of green and red by blue glow. On the other hand, it is also possible to use it combining two or more light wave length translators.

[0030] The optical shutter device in this invention can switch most preferably 390-500nm of a part of 440-500nm light or the light of full wave length the emission center wavelength of 390-700nm used by this invention. Although it changes with target displays and there is no ****** generally about the quantity and size of an optical shutter device, on the display used for the above-mentioned display application, for example, below 500-micrometer angle of the size of 1 pixel is desirable. Furthermore, on a 10 inch small full color display, 640x3x480 can illustrate the number of pixels, and about 100x300 micrometers can illustrate size as one of the good better sizes. Moreover, in a flat-panel display, in order to perform a gradation display, the thing which makes the light transmittance of a pixel change with electric control to any value can use suitably. The absolute value of light transmittance, the contrast of

the change, and rate responsibility are so desirable that they are high. Although the thickness of an optical shutter device has a useful thing 5cm or less, if thin-shape-izing and lightweight-ization are taken into consideration, it is desirable that it is 1cm or less. As an example of the optical shutter device in which these requirements are satisfied TFT, STN, strong dielectricity, antiferroelectric, the guest host using dichroic coloring matter, Transparency mold liquid crystal optical shutter devices and tungstic oxide, such as a PDN method which is polymer distributed process input output equipment, Although erection clo MIKKU, chemical clo MIKKU, etc. which are represented by oxidization iridium, Prussian blue, a viologen derivative, TTF-polystyrene, a rare earth metal-JIFUTARO cyanine complex, the poly thiophene, the poly aniline, etc. are mentioned Especially, a liquid crystal module is characterized by the thin shape, the light weight, and the low power, has practical endurance and is suitably used from the densification of a segment being possible. In this, especially a desirable thing is the guest host who used the liquid crystal of a TFT active-matrix drive, and dichroic coloring matter. since a polarizing plate is not required for the reason in that the problem of the high-speed responsibility corresponding to an animation or a cross talk does not occur in the active matrix which used the torsion nematic liquid crystal, and guest host liquid crystal -- attenuation of the light from the light source -- few -- high -- it is because brightness luminescence is attained.

[0031] The component which changes the electrical energy in this invention into light is a component which emits the light for carrying out optical pumping of the fluorescent substance contained in a light wave length translator with electrical energy, and the false side-like light emitting device with which the light guide plate for not only the light source that shape[of a field]-emits light but the light source, and optical diffusion etc. was combined is contained. 390-700nm of 390-500nm of main wavelength is 440-500nm light most preferably, and, as for the emission light which the component which changes such electrical energy into light emits, the light source to which a luminescence peak exists in this field is used. However, as for the number of the peaks in the range, especially a limit does not have one or at least two or more. Namely, the luminescence peak which can excite at least one or more fluorescent substances in this field should just exist. Furthermore, in a flat-panel display, especially the component that emits uniform sheet-like light among the components which change electrical energy into light is useful. As a component which emits uniform sheet-like light, the component which changes into sheet-like light the light taken out from the light source of the configuration of not only a component but one or more arbitration where the component itself is formed in one or more sources of field luminescence using suitable technique, such as a light guide, and diffusion, reflection, is also contained. Moreover, the component which combined such technique can also be used. It is desirable still more desirable that it is 5cm or less from a practical standpoint, and the thickness of the component which changes the electrical energy for flat-panel displays into light is 5mm or less.

[0032] As a component which changes electrical energy into field-like light among the components which change electrical energy into light, the field luminescence LED using the inorganic intrinsic EL component, an organic EL device, a small flat-surface fluorescent lamp, and an inorganic semi-conductor etc. is mentioned, for example.

[0033] Moreover, the component which changes into sheet-like light the light taken out from the light source among the components which change electrical energy into light is constituted by the translator to the light source and field-like luminescence.

[0034] As the light source of the component which changes into sheet-like light the light taken out from the light source, the electroluminescent light sources, such as various lamps, such as a halogen lamp, a mercury lamp, a hydrogen discharge tube, a neon glow lamp, a xenon lamp, a low-pressure sodium lamp, and a fluorescent lamp, the inorganic semi-conductor LED, and an organic EL device, etc. are mentioned, for example. Since various wavelength spectrums are obtained by choosing a fluorescent substance, especially the fluorescent lamp that makes a fluorescent substance emit light by the ultraviolet radiation generated from low voltage discharge of mercury has a large degree of freedom, there is comparatively little power consumption, and it is desirable especially from a small thing.

[0035] Optical diffusion devices, such as a pattern with which reflex systems and TiO2 system compounds, such as light guide plates, such as a quartz plate, a glass plate, and an acrylic board, and

aluminum sheet, various metal vacuum evaporationo film, were used for the translator to field-like luminescence of the light taken out from the light source, an optical diffusion sheet, and optical diffusion prism, consist of independence and the thing which had plurality combined preferably. Especially the translator to the sheet-like light which consists of a light guide plate, a reflecting plate, and a diffusion plate is suitably used in this invention, and can also use suitably the translator currently used for the liquid crystal display application etc. As the useful light source, a fluorescent lamp and the inorganic semi-conductor LED can be illustrated to this invention in these. Although the cold cathode tube and hot cathode tube which are used conventionally can be used for a fluorescent lamp, if the white light is used, in order that other colors may mix in blue, green, and a red luminescence field, it is desirable to take out only the blue field in the white light using a filter etc. Furthermore, if the fluorescent lamp which applied only the blue fluorescent substance is used preferably, it is effective for power consumption reduction. Moreover, since the blue of high brightness and the white inorganic semi-conductor LED can come to hand recently, use of the back light which used these light sources is also possible. Especially the blue inorganic semi-conductor LED can be suitably used from the ability of the light in a desirable wavelength field to be alternatively emitted to this invention.

[0036] The radical headquarters material of the invention in this application is a fluorescent substance light wave length translator, an optical shutter device, and the light source. An optical shutter device consists of a polarizing plate (polarizer), an electrode, liquid crystal, an electrode, and a polarizing plate (analyzer) fundamentally. Although there are two kinds of this (2) light emitting device as shown in (1) light emitting device, a fluorescence layer, a polarizing plate (polarizer), an electrode, liquid crystal, an electrode, a polarizing plate (analyzer), and drawing 1 in order of a configuration, a polarizing plate (polarizer), an electrode, liquid crystal, an electrode, a polarizing plate (analyzer), and a fluorescence layer Since, as for the approach of (1), fluorescence in three primary colors forms an image through a liquid crystal device, the problem of the conventional angle of visibility is unsolvable, but in order that, as for the approach of of (2) which has a fluorescent substance in an image display side, the light which penetrated liquid crystal may shine a fluorescent substance, it is uniform and the display of a light emission without an angle-of-visibility dependency is attained.

[0037] The more concrete configuration of (2) is shown in drawing 2 -5. Drawing 2 forms the black matrix 22 on a glass substrate 1, and produces the fluorescent substance pixels 19-21 which emit light in each color. And after attaching a polarizing plate 23, a transparent electrode (ITO) 24 is made. The light wave length translator shown in drawing 3 makes the ITO substrate which made the transparent electrode 32 form on a glass substrate 25 on the black matrix 29, the thing which made the fluorescence pixels 26-28, a polarizing plate 30, and a glass substrate 31 rival like drawing 2 . The light wave length translator shown in drawing 4 forms a polarizing plate 38 in the tooth back of the ITO substrate which made the ITO transparent electrode 40 form on a glass substrate 39, and after it makes the black matrix 37 and the fluorescence pixels 34-36 further, it makes a protective coat 33 (this has functions, such as blemish prevention and a specific wavelength cut) form. On the ITO substrate which made the ITO transparent electrode 49 form on a glass substrate 48, a polarizing plate 47, and a glass substrate 46, the light wave length translator shown in drawing 5 makes the black matrix 45 and the fluorescent substance pixels 42-44, and is equipped with a specific wavelength cut or the acid-resisting device 41 at the tooth-back side of lump glass. When anxious about the contrast fall by the horizontal leakage of the light which emitted light although the black matrix was written in these lower than a fluorescent substance, as for the height of a black matrix, it is desirable that it is higher than a fluorescent substance. Moreover, since an organic fluorescent substance can emit polarization by the solid state, when polarization can be emitted in the fixed direction to incidence polarization, as shown in drawing 6 , a polarizing plate as well as the usual color filter can be located in the outermost layer, and production of a display becomes easy. Although polarization is emitted also by mere spreading, the organic fluorescent substance is more effective to generate polarization more efficient if a fluorescent substance is put in order in the fixed direction. The approach of carrying out rubbing of the fluorescent substance applied as the approach, the approach of applying a fluorescent substance on the substrate by which rubbing was carried out, the approach that is mixed with the liquid crystal matter and applies a fluorescent substance, the method of

using LB film, etc. are raised.

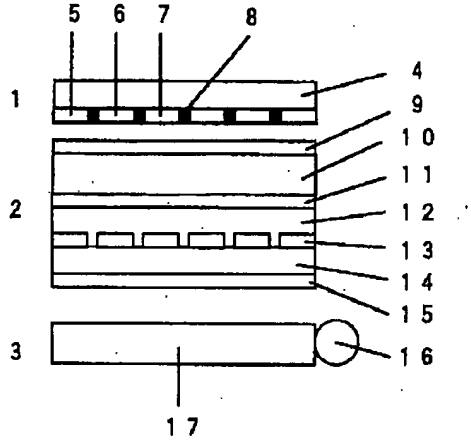
[Translation done.]

NOTICES *

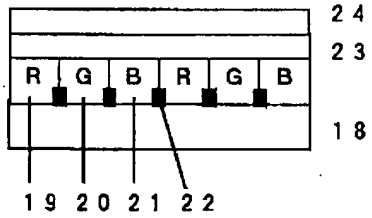
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

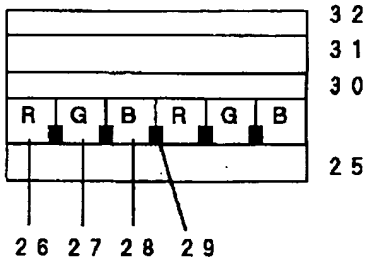
[Drawing 1]
【図1】



[Drawing 2]
【図2】

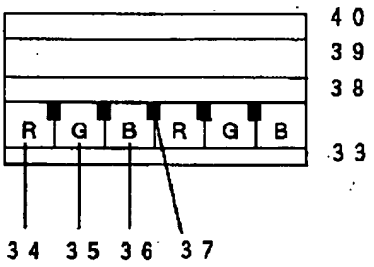


[Drawing 3]
【図3】

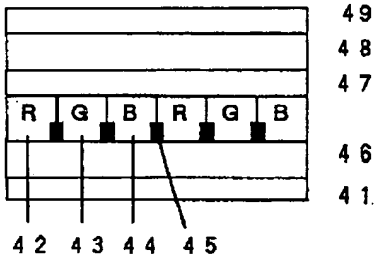


[Drawing 4]

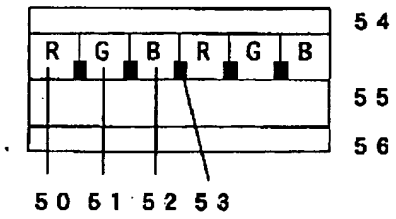
【図4】



[Drawing 5]
【図5】



[Drawing 6]
【図6】



[Translation done.]